

# Confidence Intervals

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The following code generates 100 random samples from a normal distribution with mean 3 and standard deviation 5. It also calculates 95% confidence intervals for each sample's mean and checks if the true mean falls within these intervals. The result shows that **roughly 95% of the intervals include the true mean.**

Note that the code is robust enough to calculate other  $(1-\alpha)100\%$  confidence intervals just by changing the alpha input.

```
counter <- 0
B <- 100
n <- 20
mean <- 3
stddev <- 5
alpha <- 0.05
confidence <- (1-alpha)*100

for(i in 1:B) {
  sample_data <- rnorm(n, mean = mean , sd = stddev)
  lower_ci <- mean(sample_data) - qnorm(1 - alpha/2) * stddev / sqrt(n)
  upper_ci <- mean(sample_data) + qnorm(1 - alpha/2) * stddev / sqrt(n)
  if (mean >= lower_ci && mean <= upper_ci) {
    counter <- counter + 1
  }
}
proportion <- counter/B
percent <- proportion*100
cat(percent, "%", sep="")
```

## 95%

Also note that as  $B$  = number of iterations increases, the approximation becomes more accurate.